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expires." Dr. Fitch errs as to the length of its duration; and I have also erred in the same direction — unless, indeed, there is a still greater range than my subsequent observations would indicate.¹ It is more probable, however, that our memories were at fault; for, as I have verified this year, this shrilling ordinarily lasts from two to three seconds, though occasionally longer, and is repeated at intervals of every five seconds. This note is rarely made by solitary males, or when but few are gathered together: but it is the prevailing note in the height of the season, and is made in unison; i.e., the assembled males on a given tree, or within a given grove, are prompted to it simultaneously, so that its intensity becomes almost deafening at times. It is of the same nature as that made by the dog-day Cicada (*Cicada pruinosa* Say), and in its higher and louder soundings is not unlike the shrilling of that species, though by no means so sharp and continuous. It is what in the distance gives the threshing-machine sound, and it has often recalled what I have heard in a saw-mill when a log is being cut crosswise by a circular saw.

Third, There is what may be called the intermittent, chirping sound, which consists of a series of from fifteen to thirty, but usually about twenty-two, sharp notes, sometimes double, lasting in the aggregate about five seconds. This sound is so much like that ordinarily produced by the barn or chimney swallow (*Hirundo erythrogaster*), that a description of the one would answer fairly well for both. It resembles also, though clearer and of higher pitch, the note of *Microcentrum retinerve* Burm., which I have likened to the slow turning of a child's wooden rattle highly pitched. The above notes, so far as I have recognized them, are of higher pitch, but of less volume, in the smaller, *Cassinii*, form.

The other notes — viz., that made when the insect is disturbed, and a not infrequent short cry, that may be likened to that of a chick — are comparatively unimportant: but no one could do justice to the notes of this insect without embracing the three peculiar sounds which I have attempted to describe above, and which are commingled in the woods where the species is at all common; though the undulatory screech is by far the most intense, and most likely to be remembered.

C. V. RILEY.

¹ Since this was written, I have heard, on two occasions, this note prolonged to twenty seconds; but this is quite abnormal, and I have no other evidence than the season (June 20) to prove that it came from *C. septendecim*.

LOST RIVERS.

THE phenomenon of a stream flowing merrily down from a mountain and then disappearing, is, in the west, a very common one. In following down the Rio Grande on an enlarged map, we find many streams entering into it in its upper course. In going down a little farther, reaching the San Luis valley, they are found to suddenly give out on the northern side; and, a few miles farther down, on the southern side also. The principal streams of the valley, the Rio Grande excepted, come in full force down the mountain, flow freely on, and terminate in a marsh, or a small lake, or in the sand. The beds of those which should empty into the Rio Grande are there, but there is no water in them. Similar streams are common over the south-west; and the various streams show all the different stages, from those which really go somewhere all the time, to those which empty into their main stream a part of the time, and those which, alive and full of water above, always fail to reach the stream to which they are headed below.

One time I had the curiosity to examine a stream at the point where it was lost. It was the Rio Hondo, just south of Santa Fé. We had crossed it lower down; and, though the ravine was seventy-five or a hundred feet deep, we had found it perfectly dry. We followed up its south bank for a mile or two until we struck the foot-hills, and there we found it a bright, rippling stream, leaping down from ledge to ledge, very picturesque, with some scattered trees along the banks, and so broad that it was not easy to pass over it, leaping from stone to stone, and remain dry-shod. From here my friend drove back to the crossing, and I walked down to see where and how a stream could lose itself with such a volume of water, and a path well marked out for it. As I followed it down, it ran on merrily in the midst of a little valley not more than six or eight rods wide, along which were pretty meadows alternating with clumps of bushes. It passed through the various incidents of a stream, — here a little fall, there a rapid over thickly set stones, a little farther on a pool. There seemed to be nothing unusual in it, when suddenly I noticed that the little valley widened to double its previous width, the bed became more sandy, and the stream was spread over a greater space. It was evidently going under; and, within twenty rods of where I noticed the first change, the running water had entirely disappeared. The bed of the stream was damp

for twenty rods or so more; then for a considerable distance I could get water by digging a few inches; then that indication failed, and beyond the stream-bed was entirely dry.

Not all such streams terminate thus in the middle of their bed: some terminate in a small shallow lake, some in a marsh; and either lake or marsh is pretty sure to be brackish, due to constant concentration by evaporation of the alkalis held in solution. Other lost streams fill up after a rainfall, and complete above the ground their course to the main stream. After a heavy rain in the mountains they are apt to change their 'lost' character with a suddenness and decision which may prove dangerous. The water occasionally pours down with an advancing wave or head, which is described as sometimes five or six feet high.

There is one remarkable case in New Mexico where the lost tributaries are plentiful, but the main stream does not exist. This is in a valley which lies between the Rio Grande and the Pecos River. The valley begins near the Sandia Mountains, and is shut out from the streams on each side by broken mountain-chains. It is a well-defined valley, not very broad, but having a length of perhaps three hundred miles. It is somewhat obscured by the small scale, and inaccuracies, of the smaller maps; but on a larger and correct map of the territory its valley-character is unmistakable. It lies much nearer the Rio Grande than the Pecos. Flowing into it, especially on the western side near the upper end, and on the eastern toward the lower, are numerous lost tributaries; but the primary stream has so completely disappeared that its bed can only be found at intervals.

In this valley lie the ruins of the Gran Quivira, the existence of which is not only attested by the ruins themselves, but also by the accounts of the earliest Spanish travellers. The records of the Spanish up to the latter part of the seventeenth century, when they were expelled by the Indians, are incomplete, as the Indians destroyed all that was left behind. That the Gran Quivira was well known to them, however, is shown by the fact that the most prominent ruin there is that of a church. There is now no water for many miles from the ruins. That there must have been once, can well be granted; for no large city would have been built by human beings at a distance of fifteen or twenty miles from a scanty water-supply. The valley may be named from this city, and would then be the Gran Quivira valley.

About half-way down the valley it is broken

by a long, narrow, thin layer of lava, now much broken up, and making a desolate region, locally known as the Mal-pais, or 'bad land.' The crater from which the lava was derived was near the northern end of the Mal-pais. Just above the Mal-pais an old river-bed is reached at the depth of about two hundred and fifty feet: below it, the river-bed, when found, is at a slight depth. South-west of the Apache reservation the old river-bed runs into a large salt-marsh.

A stream of no mean size seems to have once run down this valley. Not only has it now disappeared, but its bed is covered by lava and loose soil sometimes to great depths. As to the cause of the disappearance, it may have some connection with a tradition of the Indians which tells of a year of fire, when this valley was so filled with flames and poisonous gases as to be made uninhabitable. When this occurred, the chronology of the Indians is not perfect enough to tell us. That it was long ago, is attested by the depth to which the old bed is covered by detritus, probably washed down from the mountains, and by trees of considerable size which are found in some places in it. But that it was not so extremely long ago that it had become entirely uninhabitable, is made probable by the comparatively late desertion of the Gran Quivira. It is entirely possible that the Indian year of fire may have long preceded the drying-up of the part of the valley in which Gran Quivira was situated.

M. W. HARRINGTON.

ZUÑIAN CONCEPTIONS OF ANIMAL FORMS AS SHOWN IN POTTERY.

SEVERAL months ago I visited the Pueblo of the Zuñis, and while there enjoyed the opportunity of watching a group of five or six Zuñi women painting some of their pottery.

To show the degree of merit of the Zuñis in their copies of animal forms, one needs no better illustration than their attempts to reproduce the figure of the owl. It is probable that the species of this bird they have used as their model, from time immemorial, is *Bubo virginianus*, the great American horned owl. All the Zuñian clay effigies of owls have horns on their heads; and *Bubo virginianus* is not only the most common owl in the region, but the only one that is thus conspicuously tufted, being characterized by a prominent pair of feather-horns.